Click Here

Sp sp2 sp3 hybridization pdf

Sp sp2 sp3 hybridization pdf notes. Carbon hybridization sp sp2 sp3 pdf. Sp2 and sp3 hybridization. Sp sp2 sp3 hybridization examples pdf. Explain sp sp2 sp3 hybridization with examples. What is sp sp2 and sp3 hybridization. Describe sp sp2 sp3 hybridization. Sp2 hybridization bond. Sp sp2 sp3 hybridization pdf download. Define sp sp2 and sp3 hybridization. Sp sp2 sp3 hybridization pdf free download. Sp2 hybridization examples. Sp sp2 sp3 hybridization examples pdf in hindi. Sp sp2 sp3 hybridization examples.

Why do we need hybridization theory? The answer lies in its ability to predict the valency and geometry of carbon atoms, which is not possible with the information given by electron configuration alone. Let's take methane (CH4) as an example. The carbon atom has a tetrahedral geometry, where all angles are 109.5o and bond lengths are identical. This is confirmed experimentally in alkanes like methane. In order to explain this geometry, we need to look at the electron configuration of the carbon atom: C – 1s22s22p2. The valence electrons are those in the 2s and 2p orbitals, which participate in bonding and chemical reactions. However, with one s orbital and three p orbitals, it's impossible to make four degenerate bonds. This is where hybridization theory comes in – a way to explain known geometries that would not be possible otherwise. Now let's see how this works with methane as an example. First, the 2s electron jumps to the 2p orbital, resulting in an excited state of the carbon atom. Then, the s and p orbitals are mixed (hybridized) to form four identical hybrid orbitals called sp3. These hybrid orbitals compensate for the energy cost of the initial transition by having lower energy than the p orbitals. They arrange in a tetrahedral geometry, making bonds with the s orbitals of four hydrogens and explaining the symmetrical geometry of methane where all bond lengths are equal. In methane, four single C-H bonds are formed through head-on overlapping of carbon's sp3 orbitals and each hydrogen's s orbital. These σ bonds concentrate electron density on the axis connecting the C and H atoms. When two sp3-hybridized carbons connect instead, forming ethane, a sigma bond is created between the carbons and their respective hydrogens. This pattern holds true for all alkanes, where carbon atoms are sp3 hybridized with tetrahedral geometry. Any atom with four groups (atoms or lone pairs) exhibits sp3 hybridization, as seen in the oxygen molecule with two atoms and two lone pairs connected to it. The sp2 hybridization occurs when an excited state carbon mixes its s orbital with only two p orbitals, resulting in three sp2 hybrid orbitals arranged in a trigonal planar geometry (120°). An unhybridized p orbital remains perpendicular to this plane. In ethylene, two sp2 hybridized carbons form sigma bonds by overlapping one sp2 orbital and bonding with two hydrogens each. Two hydrogens make sigma bonds with each carbon using their s orbitals, leaving a single p orbital on each carbon. This p orbital participates in the formation of a π bond through side-by-side overlap with its counterpart from the adjacent carbon. This unique bonding pattern is characteristic of alkene molecules and emphasizes the significance of hybridization in determining an atom's geometry and potential for forming chemical bonds. Double-bonded atoms lie in the same plane, with a 120-degree angle between them and a 90-degree angle between their p orbitals. In contrast, sp hybridization involves mixing one s orbital with one p orbital, resulting in two sp orbitals arranged linearly at 180 degrees, leaving two unhybridized p orbitals at 90 degrees. In the context of acetylene (C2H2), carbon atoms undergo sp hybridization, forming a sigma bond through overlapping sp orbitals and a triple bond involving one sigma and two pi bonds. The key parameters for sp hybridization are linear geometry, a 180-degree angle between atoms, and the presence of one sigma and two pi bonds. Hybridization theory applies to elements like oxygen, nitrogen, halogens, and others in organic chemistry. A later post will discuss how to determine the hybridization state of any atom in an organic molecule by first identifying the hybridization state of carbon and heteroatoms (non-carbon, non-hydrogen atoms), then adding necessary lone pairs to find steric number, electron geometry, bond angles, and hybridization.